

Abstract of the Disclosure

A composite material having a microstructure model is provided with a continuous matrix of microstructure entities such as particles and grains that rotate under both remotely applied stresses and induced concentrated stresses from nearby cracks, pores and smaller particles, all networked within the matrix. The rotation microstructure entities are smooth closed contours that are elliptically-shaped. A net moment results on the boundaries of the microstructure entities effecting fracture toughening of the material. Small particles and other microstructural entities may reduce the attenuation of, transmit, and counteract the stresses induced by the rotating microstructure entities. The induced stresses counteract those stresses and strain energy densities that promote crack propagation. The result is a microstructure free of laminates, coatings, fibers and fiber architectures that effect toughening of the material against fracture.

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